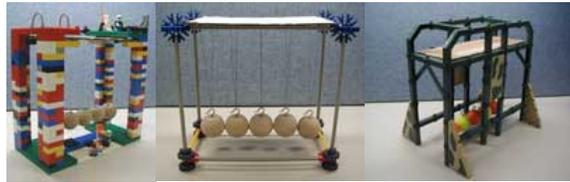




## Build a Physics Machine!



If you build it carefully, this crazy contraption demonstrates one of the basic laws of nature. This law explains many events we see every day. For example, why does a big truck come out the winner in a head-on crash with a small car, even if both are going the same speed upon impact?

**Take Note!** You may want a little help from an adult for some parts of this project.

### What you need:

- Construction set with interlocking pieces, such as
  - Construx®
  - K'Nex®
  - Lego Bricks®
  - Tinkertoys®
  - Fiddlestix®
  - Zome® System
  - Rokenbok®
  - Erector® set
- 5 large (at least 1-inch diameter) spherical beads, knobs (found in hardware stores and made as drawer pulls), or hard balls (like golf balls)
  - Whatever you use should be made of hard and dense material, like hard wood, glass, or ceramic. You need to be able to attach a thread. For beads, you can poke the thread through the hole in the center. For knobs (with a hole in one side only) or balls, you can drive a screw eye, screw, or nail into it for tying the thread to.
  - Hint: You can get 1-1/2-inch diameter wooden knobs in the doll-making supplies area of craft stores or as drawer pulls in hardware stores.
- 5 small screw eyes, screw hooks, wood screws, or nails with heads (if using knobs or balls, instead of beads)
- Sturdy cardboard, about 5 inches x 8 inches
- Thread or nylon fishing line
- Tape
- Scissors
- Ruler
- Pencil



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## What to do:

1. Build yourself a sturdy frame out of your construction set. A good, workable size is about 10 to 12 inches high, 8 to 12 inches wide, and 5 or 6 inches deep. Other sizes can work too, but you might want to try this one to start. Sides and top should be open. When done, it should wobble very little.
2. If you are using knobs or balls (instead of beads), insert a screw, screw eye, screw hook, or nail *straight* into one side of each.



Hint: If you are using screws or screw eyes, it may help if you get an adult to drill "starter holes" first.

3. Using the ruler, along one long side of the cardboard make five pencil marks that are the same distance apart as the diameter of the beads (or balls or knobs). The marks on the ends should be an equal distance from the ends of the cardboard. Make similar marks on the other long side of the cardboard, using the ruler to make sure the marks are straight across from each other.
4. Now, measure the width across the inside of the top of your structure. Measure the same distance across the width of the cardboard and draw two lines this same distance apart, centered across the width of the cardboard.



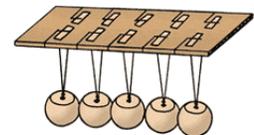
5. With the scissors, cut five slits along each side of the cardboard, at exactly the marks from Step 3, and cutting in only as far as the lines you drew in Step 4.



6. Cut five pieces of thread about 20 inches long.
7. If you are using beads, stick a thread through each bead. If you are using knobs or balls, stick a thread through each screw eye or else tie (in the center of the length of thread) a thread around the screw or nail in each knob.

(If you are using hooks, go ahead and do the next step, then hang the balls on the threads.)

8. Slide the ends of the thread into the slits in the cardboard.
9. Place the cardboard on top of your structure, with the beads or balls hanging down in the center.
10. Adjust the lengths of the threads so that the balls are all hanging freely, at exactly the same level and exactly centered.
11. When all is as nearly perfect as you can make it, tape the threads down to the top of the cardboard so they don't slip.
12. Decorate your contraption any way you like, as long as nothing gets in the way of the swinging balls. You may use other parts of your construction kit, models, things made of construction paper, or whatever. Get creative!
13. Now, pull one of the end balls out from the rest and let it go!



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